



SIM7080G&SIM800C Compatible Design

LPWA Module

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1 Introduction

This document is targeted for customers to understand the differences between SIM7080G and SIM800C. Users can use SIM7080G or SIM800C module to design and develop applications quickly.

1.1 Pin Assignment Overview

The following table shows the pin assignment of SIM7080G and SIM800C.

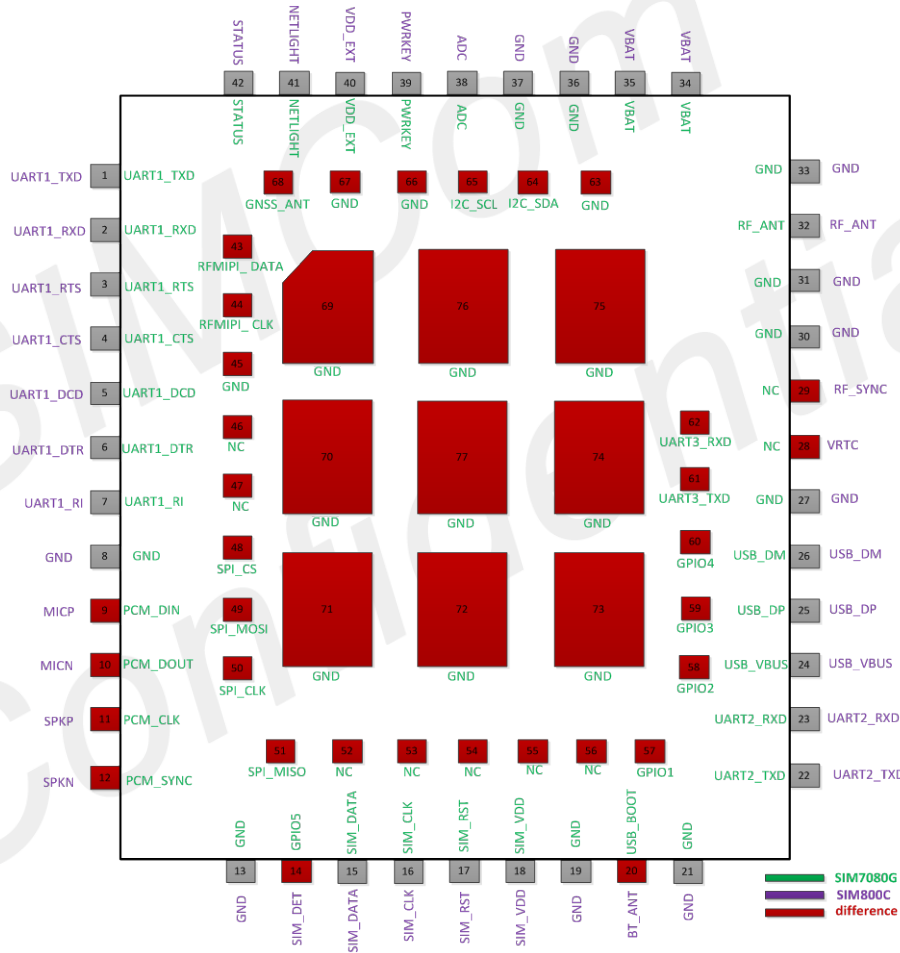


Figure 1: SIM7080G and SIM800C pin assignment (Top view)

NOTE

SIM800C do not have 43~77 pads on the inner ring.

1.2 Differences Overview

Table 1: The Differences overview

Functions	SIM800C	SIM7080G
*PIN Number	42	77
Cellular technology	GSM/GPRS	CAT M1/CAT NB2
Bluetooth	Support	Not support
GNSS	Not support	Support
Audio	Support	VoLTE (Option)
VRTC	Support	Not support
RF_SYNC	Support	Not support
PCM	Not support	Support
SPI	Not support	Support
I2C	Not support	Support
RF_MIPI	Not support	Support
Download interface	UART1 or USB	USB
Debug interface	USB	UART2 and USB
IO Power Domain	2.8V	1.8V

NOTE

SIM800C do not have 43~77 pads on the inner ring.

1.3 Differences of Electronic Characteristic

Table 2: The Differences of electronic characteristic

Pin #	SIM800C		SIM7080G	
	PIN name	Voltage range	PIN name	Voltage range
34,35	VBAT	3.4~4.4V	VBAT	2.7~4.8V
1~7	UART1	2.8V	UART1	1.8V
9~12	MIC/SPK	\	PCM	1.8V
14	SIM_DET	2.8V	GPIO5	1.8V
22~23	UART2	2.8V	UART2	1.8V
28	VRTC	1.2~3.0V	NC	\
29	RF_SYNC	2.8V	NC	\

38	ADC	0~2.8V	ADC	0~1.875V
39	PWRKEY	3V	PWRKEY	1.5V
40	VDD_EXT	2.8V	VDD_EXT	1.8V
41	NETLIGHT	2.8V	NETLIGHT	1.8V
42	STATUS	2.8V	STATUS	1.8V

NOTE

For details information, please refer to each HD guide

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Table 3: Difference in Pin Definitions

Pin #	SIM800C	SIM7080G
9	MICP	PCM_DIN
10	MICN	PCM_DOUT
11	SPKP	PCM_CLK
12	SPKN	PCM_SYNC
14	SIM_DET	GPIO5
20	BT_ANT	USB_BOOT
28	VRTC	NC
29	RF_SYNC	NC
43	(NO PAD)	RFMIPI_DATA
44	(NO PAD)	RFMIPI_CLK
45	(NO PAD)	GND
46~47	(NO PAD)	NC
48~51	(NO PAD)	SPI
52~56	(NO PAD)	NC
57~60	(NO PAD)	GPIO1~GPIO4
61~62	(NO PAD)	UART3
63	(NO PAD)	GND
64~65	(NO PAD)	I2C
66~67	(NO PAD)	GND
68	(NO PAD)	GNSS_ANT
69~77	(NO PAD)	GND

NOTE

SIM800C do not have 43~77 pads on the inner ring.

2 Recommended Footprint

2.1 Top and Bottom View

There are some differences for the footprint. SIM7080G has 77 pins, while SIM800C has only 42 pins. But SIM7080G's 1~42 pins are fully compatible with SIM800C's 1~42 pin packages.

The following figures show top and bottom view of SIM7080G and SIM800C.

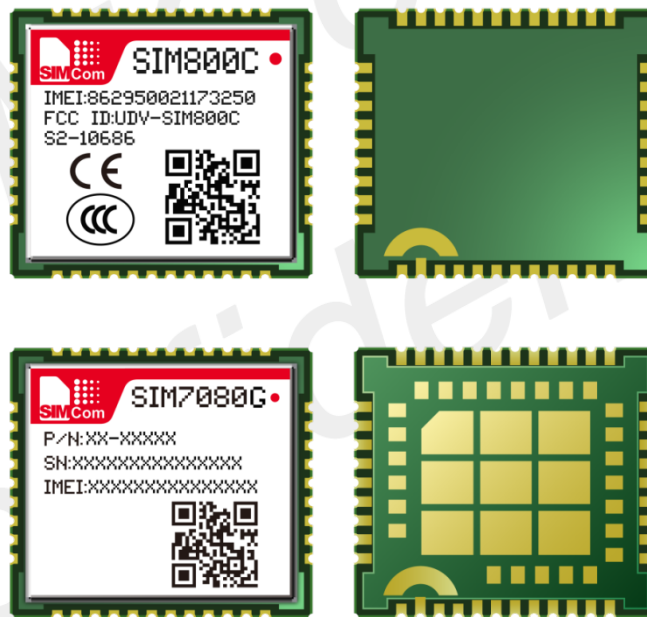


Figure 2: SIM7080G and SIM800C top and bottom view

2.2 Recommended PCB footprint outline

There are some differences between the Recommended PCB footprint outline for the SIM7080G and SIM800C.

SIM7080G and SIM800C have the same module size, and the LCC pin size of the outermost ring of the module is exactly the same.

However, the LGA pads of the inner ring are different. In the inner ring, the SIM7080G has an LGA pad with a pin number of 43~77. But the SIM800C does not have these pads.

The recommended PCB footprint outline for SIM7080G and SIM800C is shown as below.

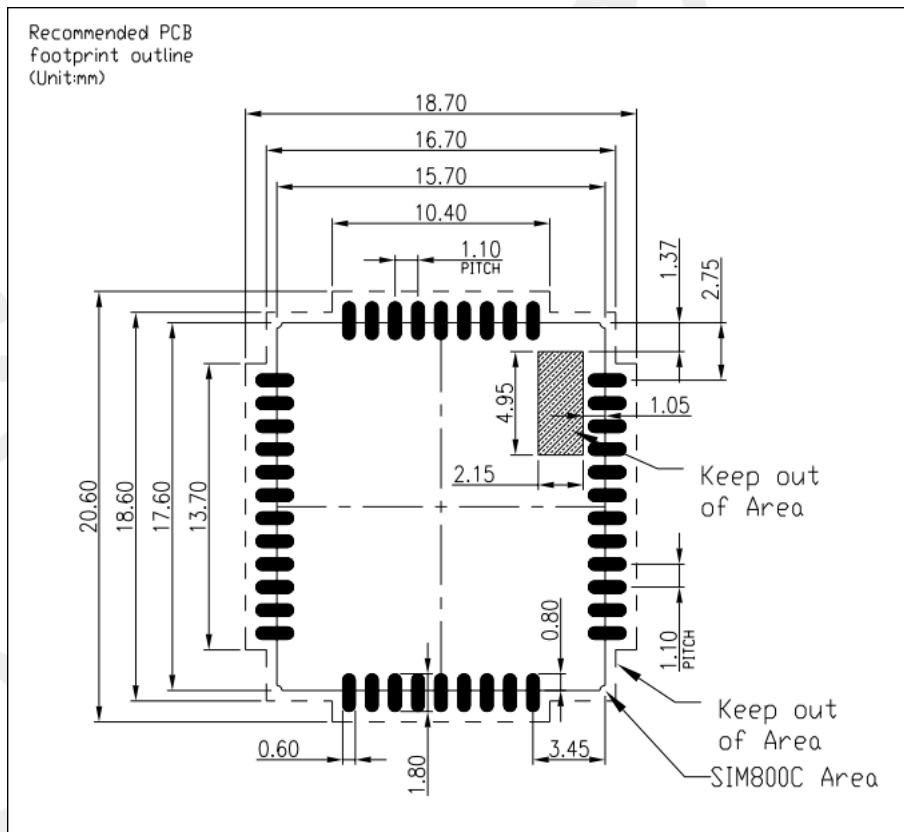


Figure 3: Recommended PCB footprint outline for SIM800C (Unit: mm)

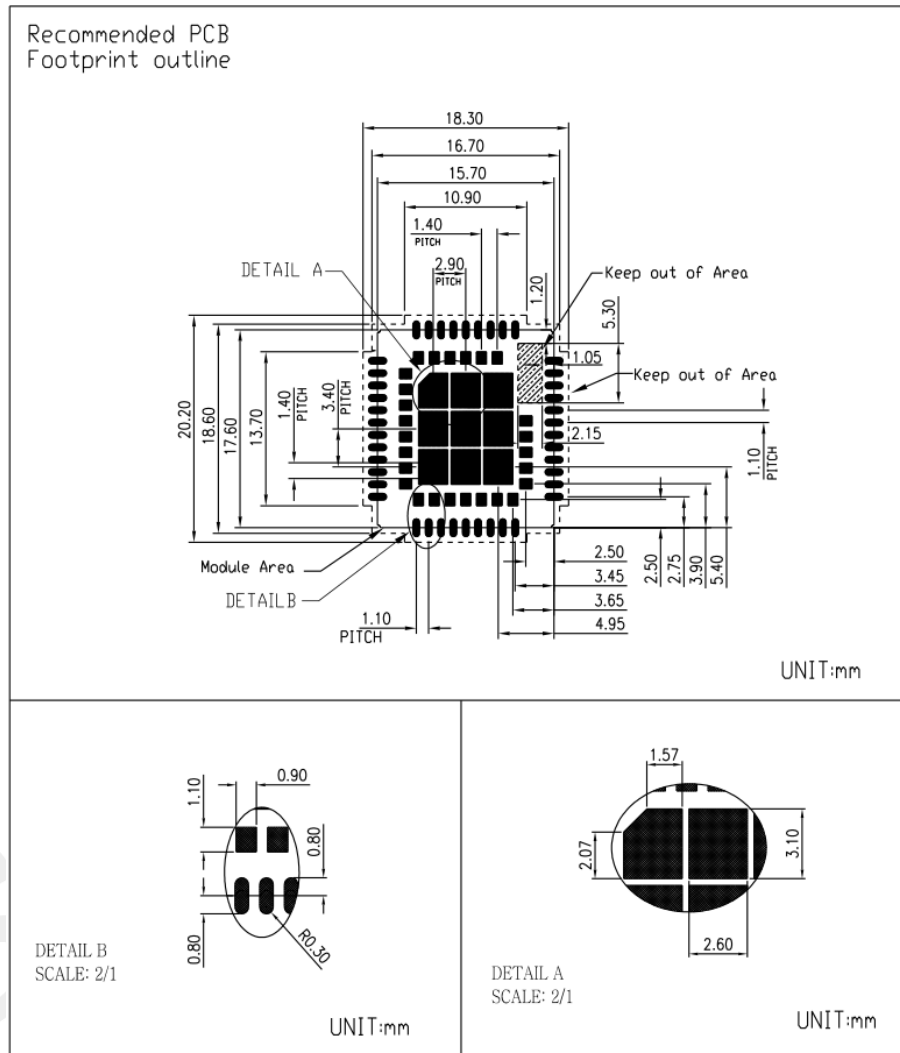


Figure 4: Recommended PCB footprint outline for SIM7080G (Unit: mm)

3 Hardware Reference Design

This chapter introduces compatible design between SIM7080G and SIM800C on main functionalities.

3.1 Power Supply

The power supply pins of SIM7080G and SIM800C include two VBAT pins (pin 34 and pin 35). VBAT pins directly supply the power to RF circuit and baseband circuit. Both VBAT pins of the module must be used together. The following figure is the reference design of the module VBAT power supply.

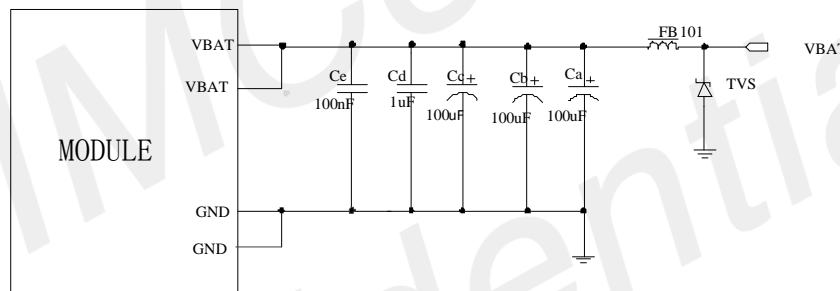


Figure 5: Power supply reference circuit

The VBAT has different input power range for SIM7080G and SIM800C. Please refer to the following table.

Table 4: The differences for VBAT power range

Module	VBAT power supply			VBAT power peak current
	Min.	Typical	Max.	Max.
SIM800C	3.4V	3.8V	4.4V	2000mA
SIM7080G	2.7V	3.8V	4.8V	500mA

Power design for a module is critical to its performance. The power supply of SIM7080G and SIM800C should be able to provide sufficient current up to 2.0A.

NOTE

For details information, please refer to each HD guide

3.2 USB Interface

SIM7080G and SIM800C provide a USB interface.
The following circuit is the reference design of USB interface.

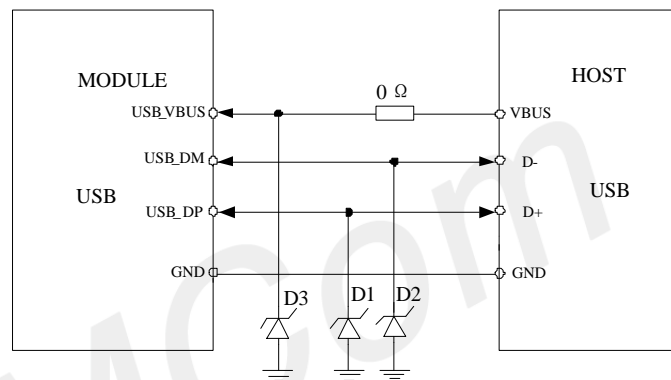


Figure 6: USB reference circuit

3.3 Network Status Indication

The NETLIGHT/STATUS pins can be used to drive a network status indicator LED. The following circuit is the reference design.

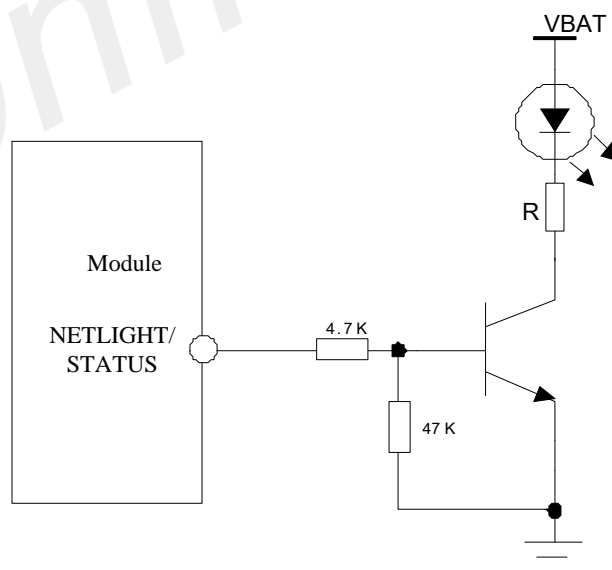


Figure 7: NETLIGHT/STATUS reference circuit

3.4 Power on/off circuit

SIM7080G and SIM800C can be turned on by driving the PWRKEY pin to a low level for a certain time. It is recommended use an open drain or collector driver to control the PWRKEY. A reference circuit is shown below.

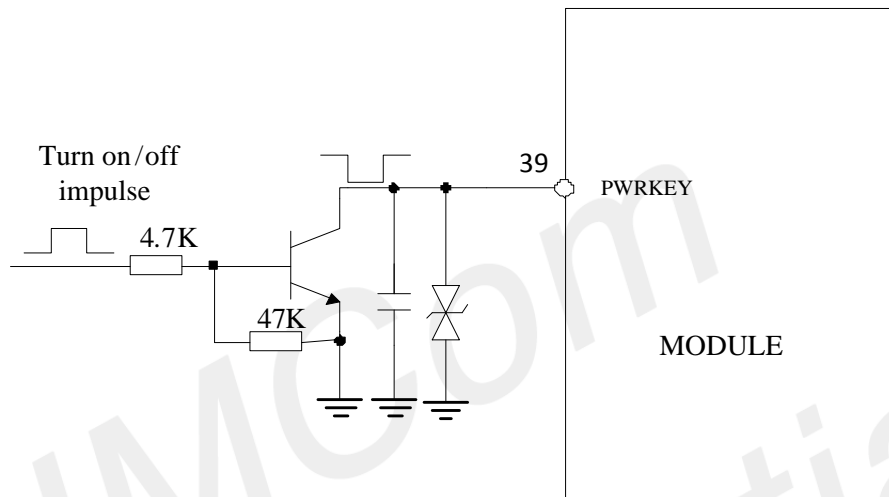


Figure 8: Power on/off reference circuit

Table 5: PWRKEY timing and electronic characteristic

Project	PWRKEY pin voltage When floating	PWRKEY input effective low level voltage For turn on	PWRKEY input low level minimum time For turn on	PWRKEY input low level minimum time For turn off
SIM800C	3V	<0.7V	>1s	>1.5s
SIM7080G	1.5V	<0.4	1s<t<12s	>1.2s

SIM7080G PWRKEY pin has its own reset function. The reset time is determined by the internal timer (default is 12 seconds). After the PWRKEY is pulled low, the module will be reset after 12 seconds. Therefore, it is not recommended to connect PWRKEY to GND all the time in external circuit design.

NOTE

For details information, please refer to each HD guide

3.5 VRTC Circuit

The 28 pin of SIM800C is VRTC, but it is NC for SIM7080G.

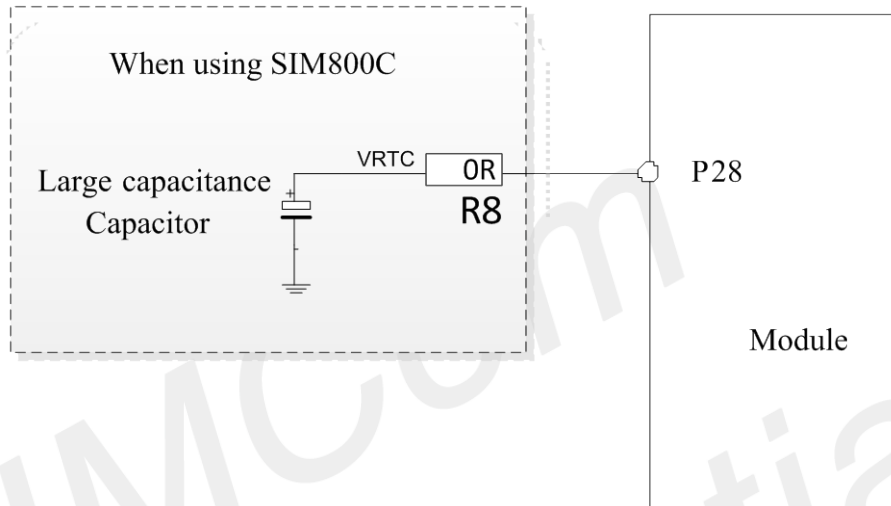


Figure 9: Reset reference circuit

3.6 USIM Interface

SIM800C supports 1.8V and 3.0V USIM cards. But SIM7080G supports 1.8V only.

The pin assignment of SIM800C USIM interface and SIM7080G USIM interface are compatible with each other. A compatible design for 6-pin USIM interface is shown in the figure below:

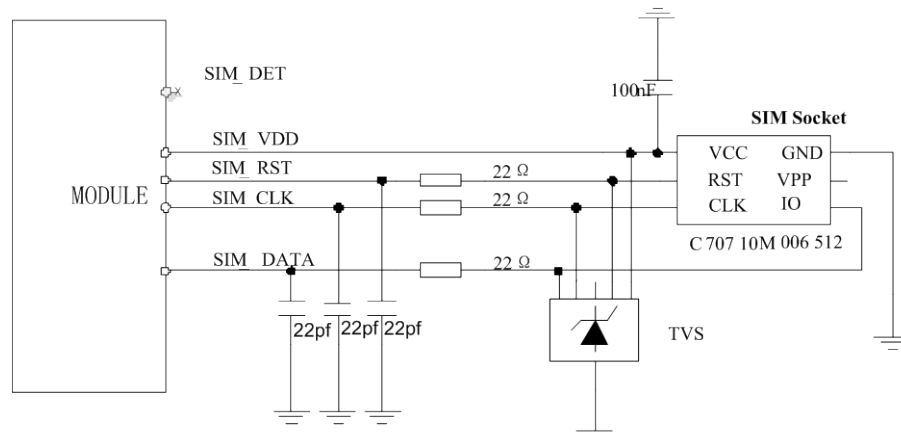


Figure 10: SIM interface reference circuit

NOTE

For details information, please refer to each HD guide

3.7 UART Interface

The module is as the DCE (Data Communication Equipment) and the client PC is as the DTE (Data Terminal Equipment). AT commands are executed through UART interface.

SIM800C UART1 is used for AT command communication, and firmware upgrade. SIM800C UART2 is only used for debug.

SIM7080G UART1 is used for AT command communication. And UART2 is only used for debug. It can also be configured as a GNSS NMEA data output port. The UART2 and UART3 are only used as UART in DAM (Downloadable Application Module) application when secondary development.

Below are the reference circuits.

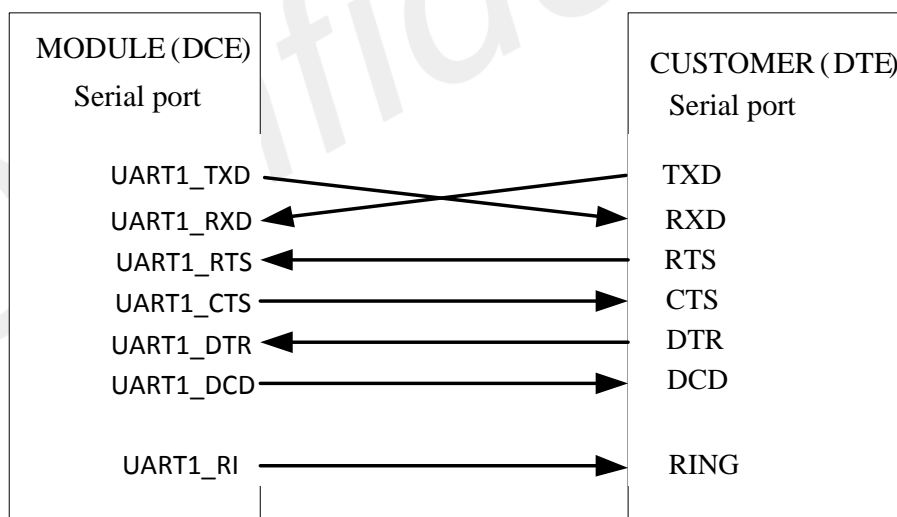


Figure 11: UART Full modem

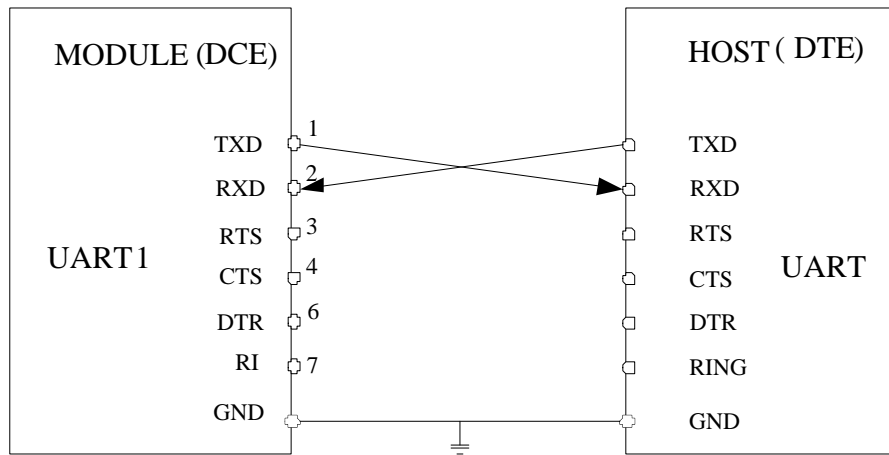


Figure 12: UART Null modem

The voltage range of each UART between SIM7080G and SIM800C are different.

Table 6: The differences for UART power level

Module	UART power level	VDD_EXT
SIM800C	2.8V	2.8V
SIM7080G	1.8V	1.8V

A level shifter should be used if external host UART interface is 3.3V level. The voltage-level translator TXB0108RGYR provided by Texas Instruments is recommended. The reference design of the TXB0108RGYR is in the following figures.

NOTE

For details information, please refer to each HD guide

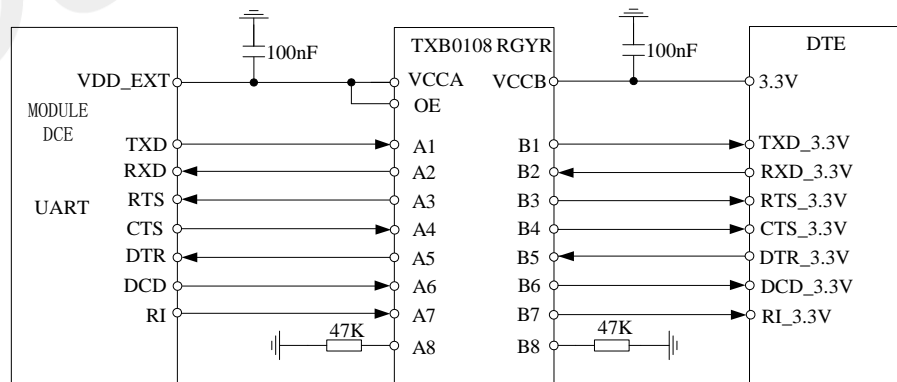


Figure 13: Reference circuit of voltage-level translator

NOTE

The VDD_EXT of each project in the diagram is different. For details information, please refer to each HD guide.

3.8 Audio Interface

SIM800C provides an analog audio interface.
But SIM7080G provides PCM interface instead of analog audio function.
The following circuit is the reference design.

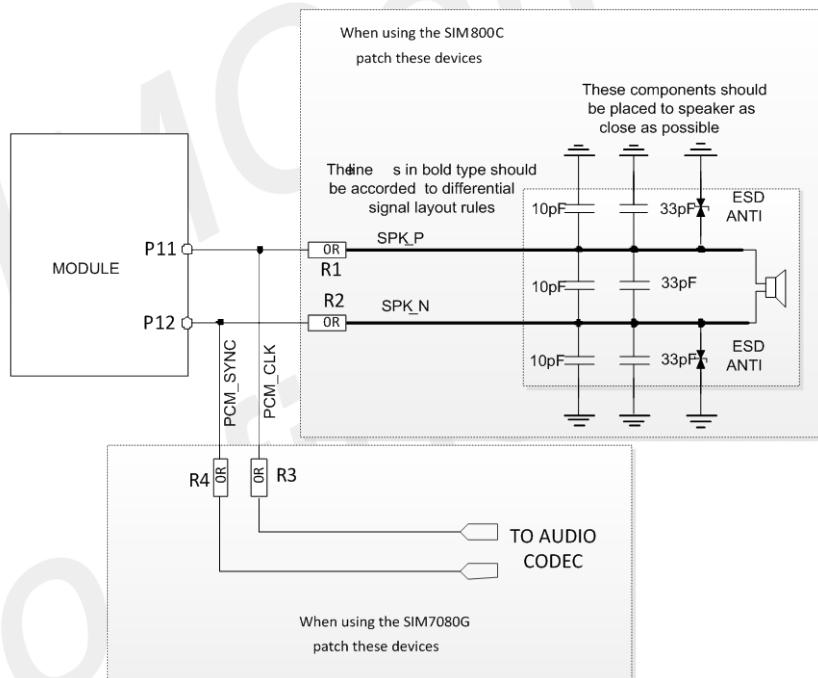


Figure 14 : Speaker reference circuit

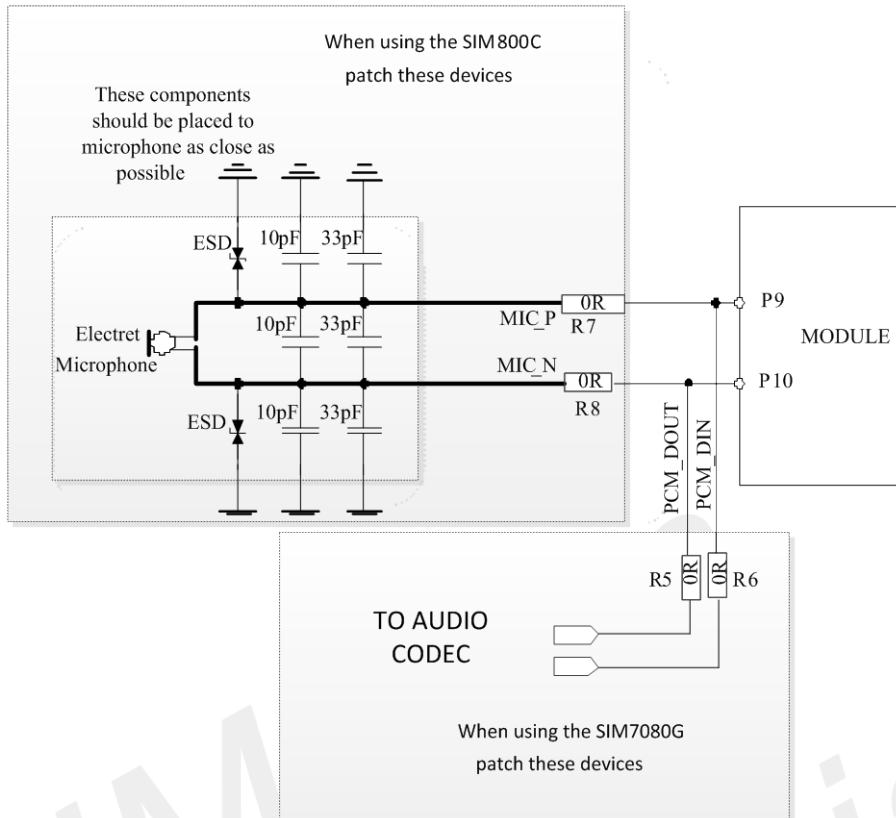


Figure 15 : Microphone reference circuit

NOTE

For details information, please refer to each HD guide

3.9 GPIO interface

There are some dedicated GPIO pins for SIM7080G and SIM800C.

Table 7: Dedicated Pins Description for module

	SIM800C	SIM7080G
GPIO voltage domain	2.8V	1.8V
VDD_EXT	2.8V	1.8V

The following circuit is the reference design.

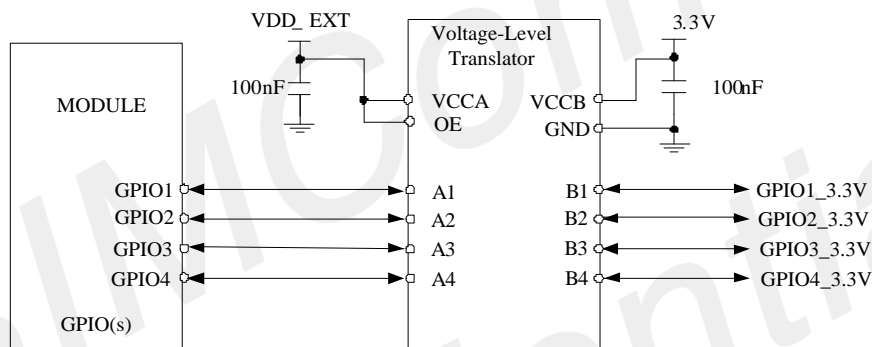


Figure 16: Reference circuit of GPIO voltage-level translator

3.10 ADC interface

SIM7080G and SIM800C modules provide an ADC input channel to read the external voltage value. They have different sampling scope.

Table 8: Module ADC Interface Information

interface	SIM800C	SIM7080G
ADC	0~2.8V	0~1.875V

3.11 RF Interface

SIM7080G or SIM800C provide a cellular antenna interface.

External antenna should be placed close to module RF pad through micro-strip line or other types of RF trace, and the trace impedance must be controlled as 50Ω.

The following circuit is a reference design for SIM7080G and SIM800C RF antenna circuit.

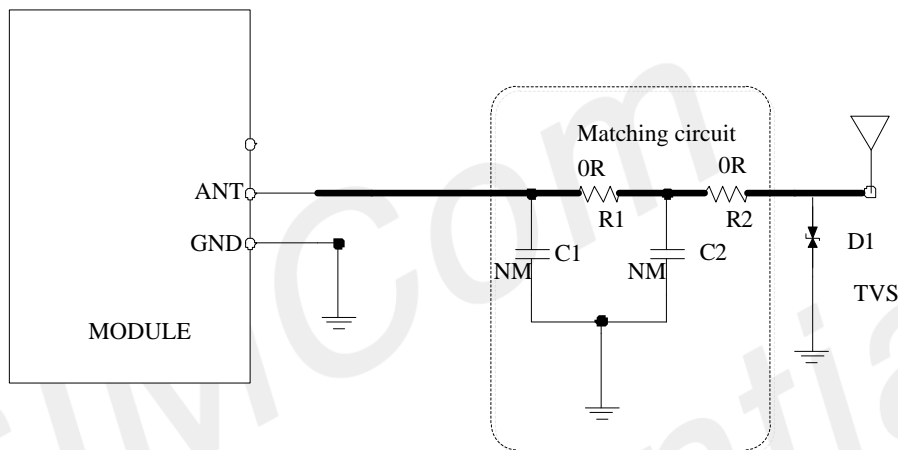


Figure 17: Antenna matching circuit

The capacitors (C1/C2) are not mounted and a 0Ω resistor is mounted on R1 and R2 by default. The component D1 is a TVS for ESD protection, and it is optional for users according to application environment. The RF test connector is used for the conducted RF performance test, and should be placed as close as to the module's RF_ANT pin. Two TVS are recommended in the table below.

Table 9: Recommended TVS

Package	Part Number	Vender
0201	LXES03AAA1-154	Murata
0402	LXES15AAA1-153	Murata

3.12 GNSS Interface

SIM7080G supports GNSS interface. But SIM800C doesn't support.

Users can adopt an active antenna or a passive antenna to SIM7080G. If using a passive antenna, an external LNA is a must to get better performance. The following figures are the reference circuits.

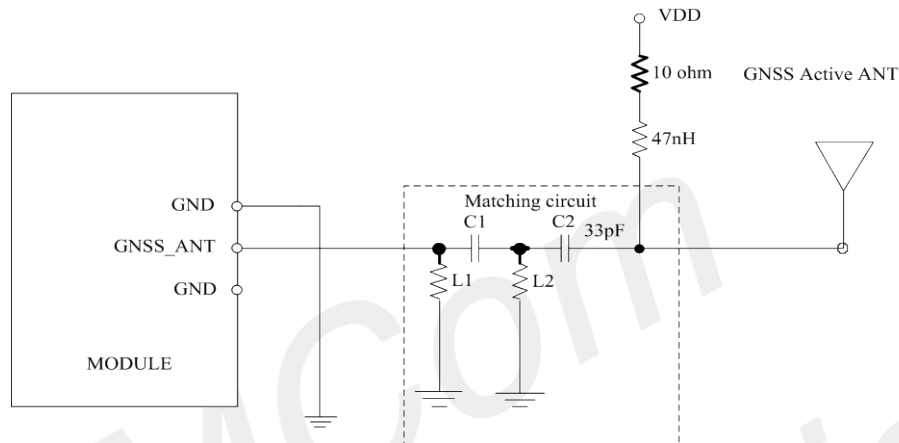


Figure 18: Active antenna circuit

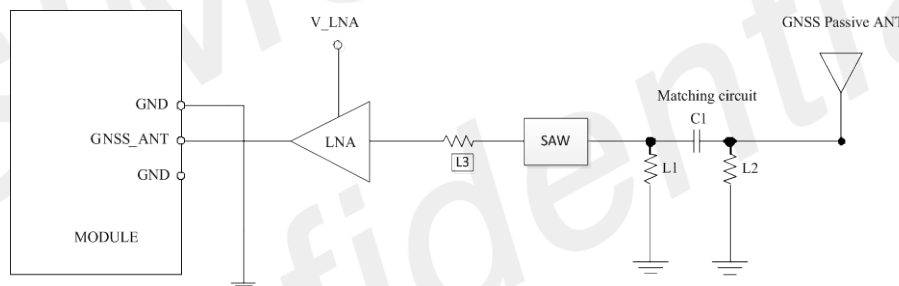


Figure 19: Passive antenna circuit (Default)

In above figures, the components C1, L1 and L2 are used for antenna matching. Usually, the values of the components can only be achieved after antenna tuning and usually provided by antenna vendor. C2 is used for DC blocking. L3 is the matching component of the external LNA, and the value of L3 is determined by the LNA characteristic and PCB layout. Both VDD of active antenna and V_LNA need external power supplies which should be considered according to active antenna and LNA characteristic. LDO/DCDC is recommended to get lower current consuming by shutting down active antennas and LNA when GNSS is not working.

GNSS can be tested by NMEA port. NMEA sentences can be obtained through UART or USB automatically. NMEA sentences include GSV, GGA, RMC, GSA, and VTG. Before using GNSS, user should configure SIM7080G in proper operating mode by AT command. Please refer to related documents for details. SIM7080G can also get position location information through AT directly.

NOTE

For details information, please refer to each HD guide

3.13 RFMIPI Interface

SIM7080G provides a set of antenna MIPI buses. It can be used to control the antenna tuner to improve antenna performance. But SIM800C doesn't support.

The reference circuit is shown in the following figure:

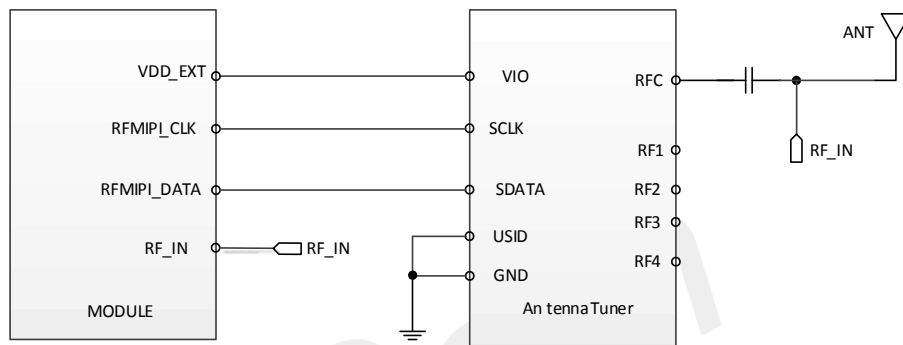


Figure 20: RFMIPI interface reference circuit

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4 Appendix

4.1 Related documents

Table 10: Related documents

SN	Document name	Remark
[1]	SIM7080G_Hardware_Design	SIM7080G Hardware Design Document
[2]	SIM800C_Hardware_Design	SIM800C Hardware Design Document

4.2 Terms and Abbreviation

Table 11: Terms and Abbreviations

Abbreviation	Description
ESD	Electrostatic Discharge
DAM	Downloadable Application Module
GSM	Global Standard for Mobile Communications
I2C	Inter-Integrated Circuit
PCB	Printed Circuit Board
PCS	Personal Communication System, also referred to as GSM 1900
RF	Radio Frequency
RTC	Real Time Clock
Rx	Receive Direction
SIM	Subscriber Identification Module
UART	Universal Asynchronous Receiver & Transmitter
NC	Not connect
EDGE	Enhanced data rates for GSM evolution
HSDPA	High Speed Downlink Packet Access HSUPA
HSDPA	High Speed Downlink Packet Access HSUPA
HSDPA	High Speed Downlink Packet Access HSUPA
USIM	Universal subscriber identity module
UMTS	Universal mobile telecommunications system
SMPS	Switch Mode Power Supply